Proceedings of the Iowa Academy of Science

Volume 41 | Annual Issue Article 36

1934

The Adsorption of Certain Ketones and Esters by Activated Charcoal

J. N. Pearce
State University of Iowa

A. C. Hanson
State University of Iowa

Previous investigators have found that at low pressures of one atm., or less about one-half of the gaseous decomposition products are unsaturated hydrocarbons with no products boiling higher than hexane itself. It has been found that under high pressures the low boiling olefins are practically completely converted by polymerization and hydrogenation either to saturated aliphatic hydrocarbons or to cyclic and aromatic hydrocarbons.

The percentages of CH_4, C_2H_6, C_3H_8 and C_4H_{10} in the gaseous products remain practically constant at ten-degree intervals between 460° and 490°, namely, 25, 47, 15 and 7 per cent, respectively. At 460° the respective proportions of H_2, C_2H_4, C_3H_6 and butenes in the gaseous products are 2.1, 1.4, 1.5 and 2.1 per cent. These decrease with further rise in temperature.

497° both hydrogen and ethylene have completely disappeared, and the percentages of propane, butanes, propene and butene have dropped to 5.5, 4.0, 0.04 and 0.16 percent, respectively. At this temperature the abundant formation of carbon begins; the proportion of methane is noticeably increased and continues to increase with further rise in temperature. Irrespective of time or temperature, the proportion of ethane takes a sudden jump at this point and then drops back to its original practically constant value.

Owing to the small capacity of the bomb it was not possible to obtain at this time sufficient quantity of the liquid products to make an accurate quantitative analysis of the liquid products. However, microdistillations and other qualitative tests showed the presence of cycloparaffins, benzene, subsituted benzenes, and unsaturated higher forms.

THE ADSORPTION OF CERTAIN KETONES AND ESTERS BY ACTIVATED CHARCOAL

J. N. Pearce and A. C. Hanson

The adsorption of acetone, methyl-ethyl ketone, diethyl ketone, ethyl formate, ethyl acetate, n-propyl acetate and methyl propionate by activated charcoal has been measured for temperatures between 0° and that of decomposition. The Langmuir isotherms, obtained by plotting $p/\frac{x}{m}$ against the pressure p, are rectilinear at the lower temperatures and up to 60 mm. pressure. At higher temperatures and pressures the isotherms tend to deviate from the straight line and bend toward the pressure axis. The amount of vapor adsorbed per gram of charcoal decreases with increase in the

complexity of the adsorbed vapor molecules; further it is found to decrease with increase in the value of the van der Waals constant, *b*.

The heats of adsorption ΔH, calculated from the adsorption isosteres were found to be: acetone -10690 cal., methyl-ethyl ketone -11225 cal., diethyl ketone -11820 cal., ethyl formate -13140 cal., methyl acetate -11520 cal., ethyl acetate -11920 cal., n-propyl acetate -13200 cal., methyl propionate -14030 cal. As is generally found, the heats of adsorption for the ketones, thus calculated, are lower than those which have been determined experimentally.

DEPARTMENT OF CHEMISTRY,
STATE UNIVERSITY OF IOWA,
IOWA CITY, IOWA.

SOME OBSERVATIONS OF THE BOILING POINTS OF TERNARY LIQUID MIXTURES

JOHN DUNHAM AND W. C. OELKE

An exposition of an apparatus for the determination of the boiling points of liquid mixtures under constant pressure, and the results of preliminary investigations upon ternary mixtures of some common organic liquids.

GRINNELL COLLEGE,
GRINNELL, IOWA.

THE USE OF ELECTRON TUBES AS SUPER-SENSITIVE RELAYS

W. C. OELKE

A brief discussion of the use of electron tubes in relay circuits controlling physical apparatus. The construction and operation of several relay units were shown.

GRINNELL COLLEGE,
GRINNELL, IOWA.

THE DIPOLE MOMENTS OF CERTAIN ORGANIC COMPOUNDS

J. N. PEARCE AND L. F. BERHENKE

The dielectric constants and densities of dilute solutions of p-brombenaldehyde, p-tolualdehyde, p-hydroxybenzaldehyde and